

Process Specification for Lockwiring

Engineering Directorate

Structural Engineering Division

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Process Specification for Lockwiring

Prepared by: Signature on file 1/17/07
 Jay E. Bennett Date
 Materials and Processes Branch
 ES4

Approved by: Signature on file 1/19/07
 Bradley S. Files, Chief Date
 Materials and Processes Branch
 ES4

REVISIONS		
VERSION	CHANGES	DATE
--	Original version	5/15/96
A	Revised Section 4, 8	7/30/99
B	Changed Division name. Revised Section 3.1 (Work Instructions) and moved to Section 6.1, restructured Section 6, removed process qualification requirement in Section 7.0., revised Section 8.0, and revised Section 9.0 (Training).	10/2004
C	Updated document number in Section 4.0 (References)	1/2007

1.0 **SCOPE**

This process specification establishes the requirements for lockwiring fasteners used in flight hardware manufactured by JSC.

2.0 **APPLICABILITY**

This specification shall be applicable whenever a lockwire application is invoked per section 3.0, "Usage".

3.0 **USAGE**

This process specification shall be called out on the engineering drawing (reference JPR 8500.4) by using a drawing note. For example:

LOCKWIRE PER NASA/JSC PRC-9005.

4.0 **REFERENCES**

The following references were used to develop this process specification:

SOP-007.1 *Preparation and Revision of Process Specifications*

JPR 8500.4 *Engineering Drawing System Manual*

The following documents are called out as an extension of the requirements given in this specification:

NASM 33540 *Safety Wiring and Cotter Pinning, General Practices for*

NASM 20995 *Wire, Safety and Lock*

5.0 **MATERIAL REQUIREMENTS**

No special materials are needed for this process.

6.0 PROCESS REQUIREMENTS

6.1 WORK INSTRUCTIONS

All work shall be performed to written procedures. The work instructions shall contain sufficient detail to ensure that the manufacturing process produces consistent, repeatable products that comply with this specification.

For work performed at JSC facilities, these work procedures consist of Detailed Process Instructions (DPI's).

For contracted work, the contractor shall be responsible for preparing and maintaining, and certifying written work procedures that meet the requirements of this specification.

6.2 GENERAL REQUIREMENTS

All lockwiring shall be performed according to the installation requirements of NASM 33540.

7.0 PROCESS QUALIFICATION

None required.

8.0 PROCESS VERIFICATION

Self verification shall be performed by the installer to ensure that the following steps, in accordance with NASM 20995 and NASM 33540 were performed:

- a. Verify the use of proper safety wire material (per table, NASM 20995)

Inconel, Monel	natural
Copper	yellow
Aluminum alloy	blue

- b. Verify the use of proper diameter safety wire as called out in NASM 33540, Section 2.a-c.
- c. Verify the use of proper safety wire configuration geometry as depicted in NASM 33540, Figure 1. Ensure that the lockwire shall be put in tension when the part tends to loosen, and that the lockwire is tight but not overstressed.

- d. Verify that where it is necessary to break the wire quickly, (for securing emergency devices) only copper wire is used.
- e. Verify the use of the proper method according to application:

Method	Geometric Configuration	Usage Application
Single wire	Use for closely spaced, (2" between centers, max) closed geometric patterns (triangle, rectangle, circle, etc).	Use for shear and seal wiring, and in electrical systems.
Double twist	Must use for > 2" spacing, and for screws in closely spaced geometric patterns for usage applications described.	All others, and especially: to secure hydraulic or air seals, hold hydraulic pressure, or in critical areas of clutch mechanisms and superchargers.

- f. Verify that safety wire pigtail has been bent back or under to prevent snagging per NASM 33540, Section 5.

9.0 TRAINING AND CERTIFICATION OF PERSONNEL

This process shall be performed by personnel qualified through training or experience and certified by their supervision to conduct the process.

10.0 DEFINITIONS

None.